SCOPE OF CLAIMS

[1] A method of an optical fiber base material comprising the steps of:

gripping both ends in a longitudinal direction of an optical fiber base material by a pair of gripping devices; and

while pulling the optical fiber base material by moving one or both of the pair of the gripping devices in a first direction parallel to the longitudinal direction, moving a heating device relative to the optical fiber base material in a second direction opposite to the first direction;

wherein stretch of the optical fiber base material is performed while changing the relative moving speed Vb(x) in accordance with expression (1):

$$Vb \cdot [D_{max}/D(x)]^2 \leqq Vb(x) \leqq Vb \cdot [D_{max}/D(x)]^3 \quad (1)$$

where Vb represents a reference speed, D_{max} represents a maximum outer diameter of the optical fiber base material, D(x) represents an outer diameter at a heated position x of the optical fiber base material, and Vb(x) represents a relative moving speed of the heating device relative to the optical fiber base material at the heated position x.

[2] The stretching method according to claim 1, wherein the outer diameter of the optical fiber base material is measured over the longitudinal direction thereof in advance of the stretching, and the stretching of the base material is performed while changing the relative moving speed of the heating device relative to the fiber base material on the basis of results of the measurement.

[3] The stretching method according to claim 1, wherein a pulling speed of the optical fiber base material is set within a range satisfying the following expression (2)

$$0.5 \leqq (Dt/D_{max})^2 \leqq 0.99 \quad (2)$$

where Dt is a target stretched outer diameter, and D_{max} is the same as the meaning defined in the expression (1).

[4] The stretching method according to claim 1, wherein the heating device is a burner, and a point at which a center line of the heating burner nozzle crosses at right angles with an axial line of the optical fiber base material lies in a position distant by 0 to 50 mm in the second direction from a position at which the outer diameter of the optical fiber base material starts changing due to heat application by the heating burner.

[5] The stretching method according to claim 4, wherein a combustion gas used in the heating device is oxygen, and a flammable gas is hydrogen or propane.

[6] The stretching method according to claim 1, wherein the heating device is an electric furnace, the electric furnace is disposed in parallel with the longitudinal direction of the optical fiber base material, and a point at which a center of the heating burner in the longitudinal direction crosses at right angles with an axial line of the optical fiber base material lies in a position distant by 0 to 50 mm in the second direction from a position at which the outer diameter of the optical fiber base material starts changing due to heat application by the electric furnace.

[7] The stretching method according to claim 1, wherein the

relative speed is a relative speed created by fixing one of the pair of the gripping devices, and moving the heating device in the second direction.

[8] The stretching method according to claim 1, wherein the relative speed is a relative speed created by moving both of the pair of the gripping devices at different speeds in the first direction, and fixing the heating device.

[9] The stretching method according to claim 1, wherein the relative speed is a relative speed created by moving both of the pair of the gripping devices at different speeds in the first direction, and moving the heating device in the second direction.

[10] A stretching apparatus of an optical fiber base material comprising:

a pair of gripping devices for gripping both ends in a longitudinal direction of the optical fiber base material;

a heating device for heating a periphery of the optical fiber base material;

a gripping device moving device for moving one or both of the pair of the gripping devices to pull the optical fiber base material in a first direction parallel to the longitudinal direction; and

an arithmetic and control unit;

wherein the arithmetic and control unit performs an arithmetic and control with a target moving speed at a heated position of the optical fiber base material being set to the relative moving speed of the heating device relative to the optical fiber

base material, and when the relative moving speed is Vb(x), Vb(x) is changed in accordance with expression (1):

$$Vb \cdot [D_{max}/D(x)]^2 \leqq Vb(x) \leqq Vb \cdot [D_{max}/D(x)]^3 \quad (1)$$

where Vb represents a reference speed, D_{max} represents a maximum outer diameter of the optical fiber base material, D(x) represents an outer diameter of the optical fiber base material at the heated position x, and Vb(x) represents the relative moving speed of the heating device relative to the optical fiber base material at the heated position x.

[11] The stretching apparatus according to claim 10, further comprising an outer diameter measuring device for measuring an outer diameter at each position in the longitudinal direction of the optical fiber base material.

[12] The stretching apparatus according to claim 10, wherein the arithmetic and control unit also computes a pulling speed of the optical fiber on the basis of the outer diameter at each position in the longitudinal direction of the optical fiber base material, and the gripping device moving device moves one or both of the pair of the gripping devices on the basis of the results.

[13] The stretching apparatus according to claim 12, wherein the pulling speed of the optical fiber is set within a range satisfying the following expression (2):

$$0.5 \leqq (Dt/D_{max})^2 \leqq 0.99 \quad (2)$$

where Dt is a target stretched outer diameter, and D_{max} is the same as the meaning defined in the expression (1).

[14] The stretching apparatus according to claim 10, wherein, in

a case where the both of the pair of the gripping devices are pulled, the gripping devices at the both ends in the longitudinal direction are moved by the gripping device moving device at different speeds so that the optical fiber base material is pulled in the first direction.

[15] The stretching apparatus according to claim 10, wherein the heating device is a heating burner.

[16] The stretching apparatus according to claim 15, wherein the heated position is at a position distant by 0 to 50mm from a position at which the outer diameter of the optical fiber base material starts changing due to heat application by the heat burner.

[17] The stretching apparatus according to claim 15, wherein a combustion gas used in the heating device is oxygen, and a flammable gas is hydrogen or propane.

[18] The stretching apparatus according to claim 10, wherein the heating device is an electric resistor furnace.

[19] The stretching apparatus according to claim 10, further comprising a heating device moving device for moving the heating device in a second direction opposite to the first direction.